

# How Many COVID-19 Tests per Coronavirus Case are Enough?

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## Introduction

In our poster presentation we display COVID-19 testing data available from *Our World in Data* whose database sponsors ask the question “Why is data on testing important?”

We use JMP v 15.1 to help us answer the question: How many COVID-19 tests per case are enough?

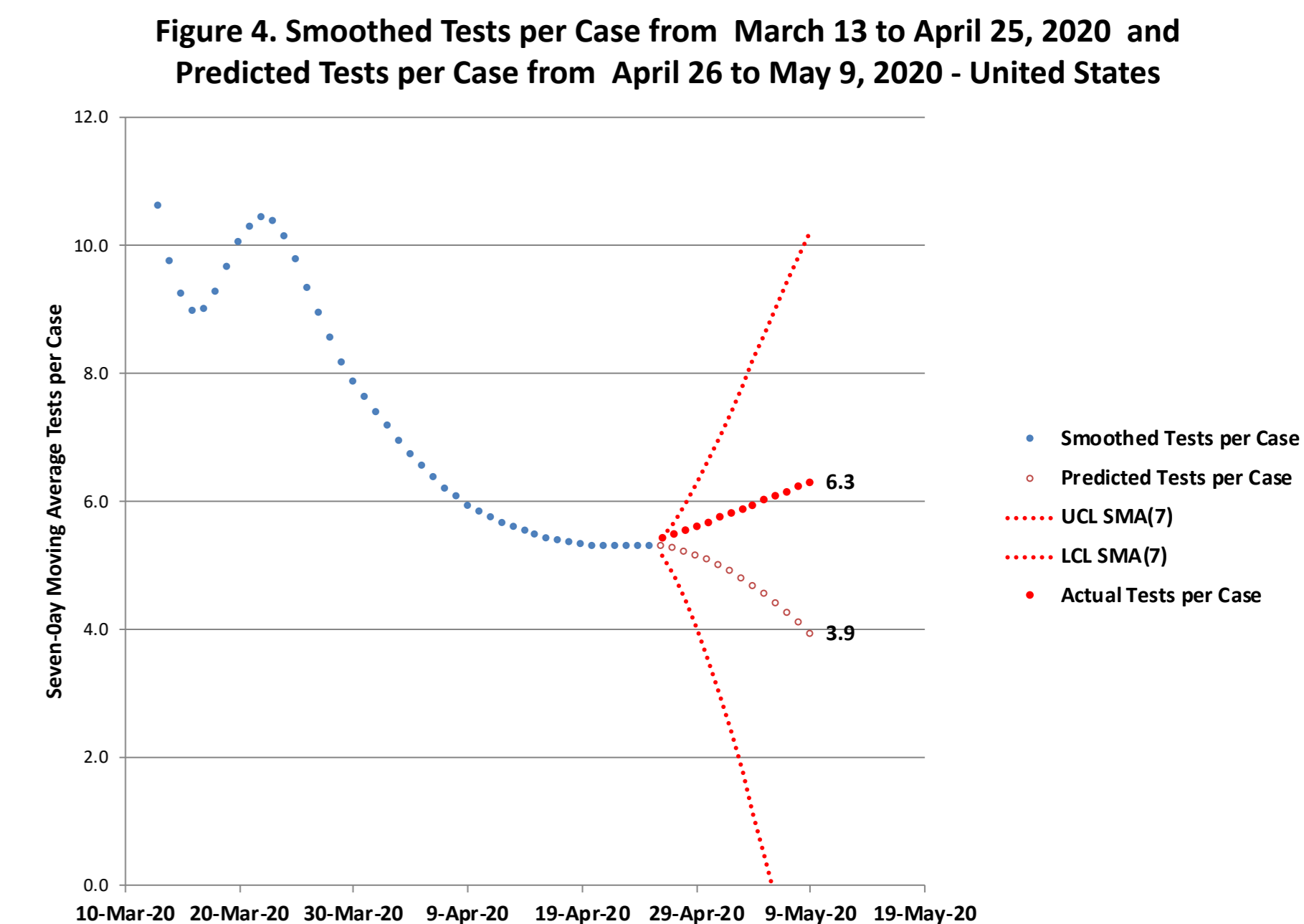
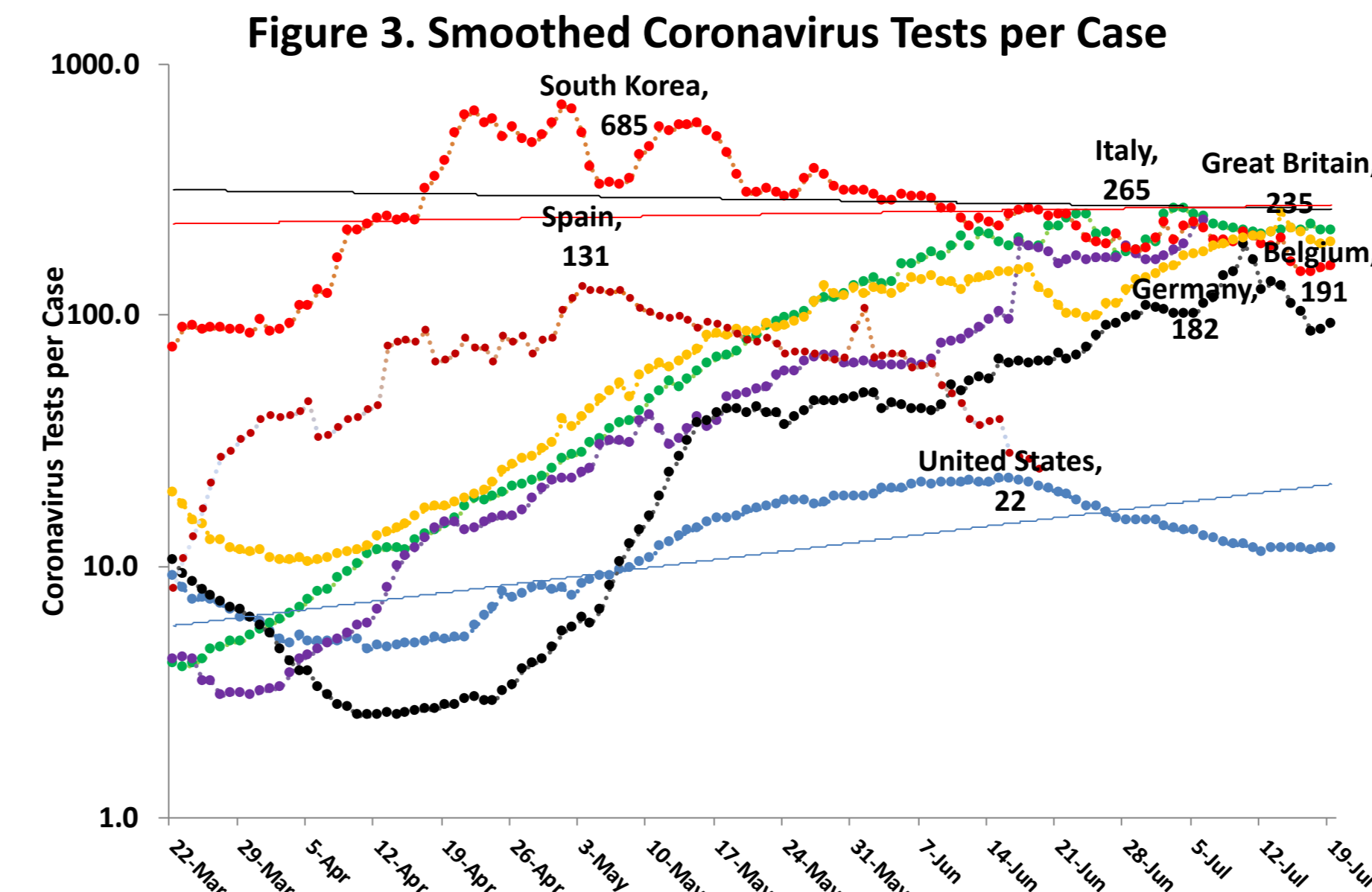
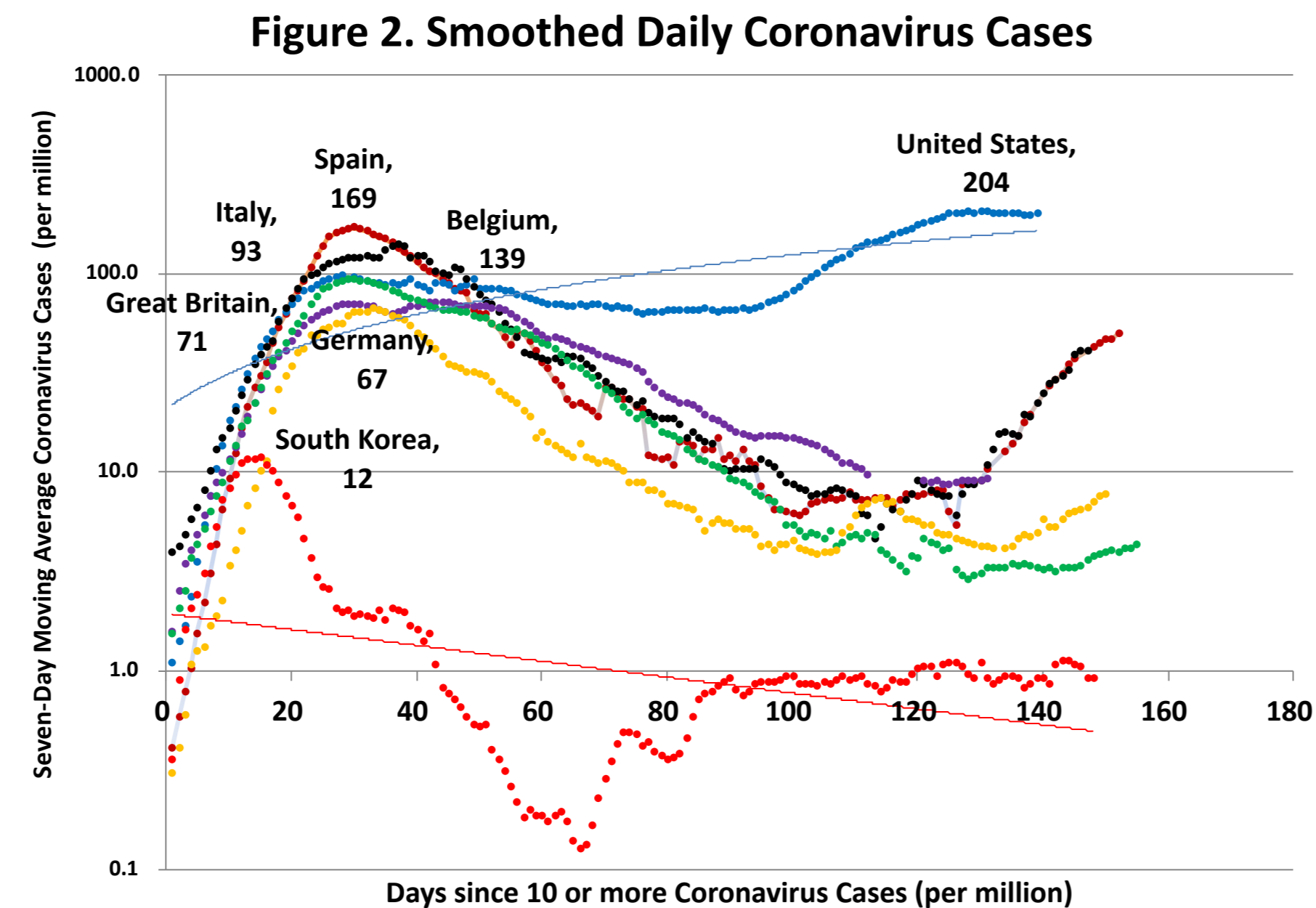
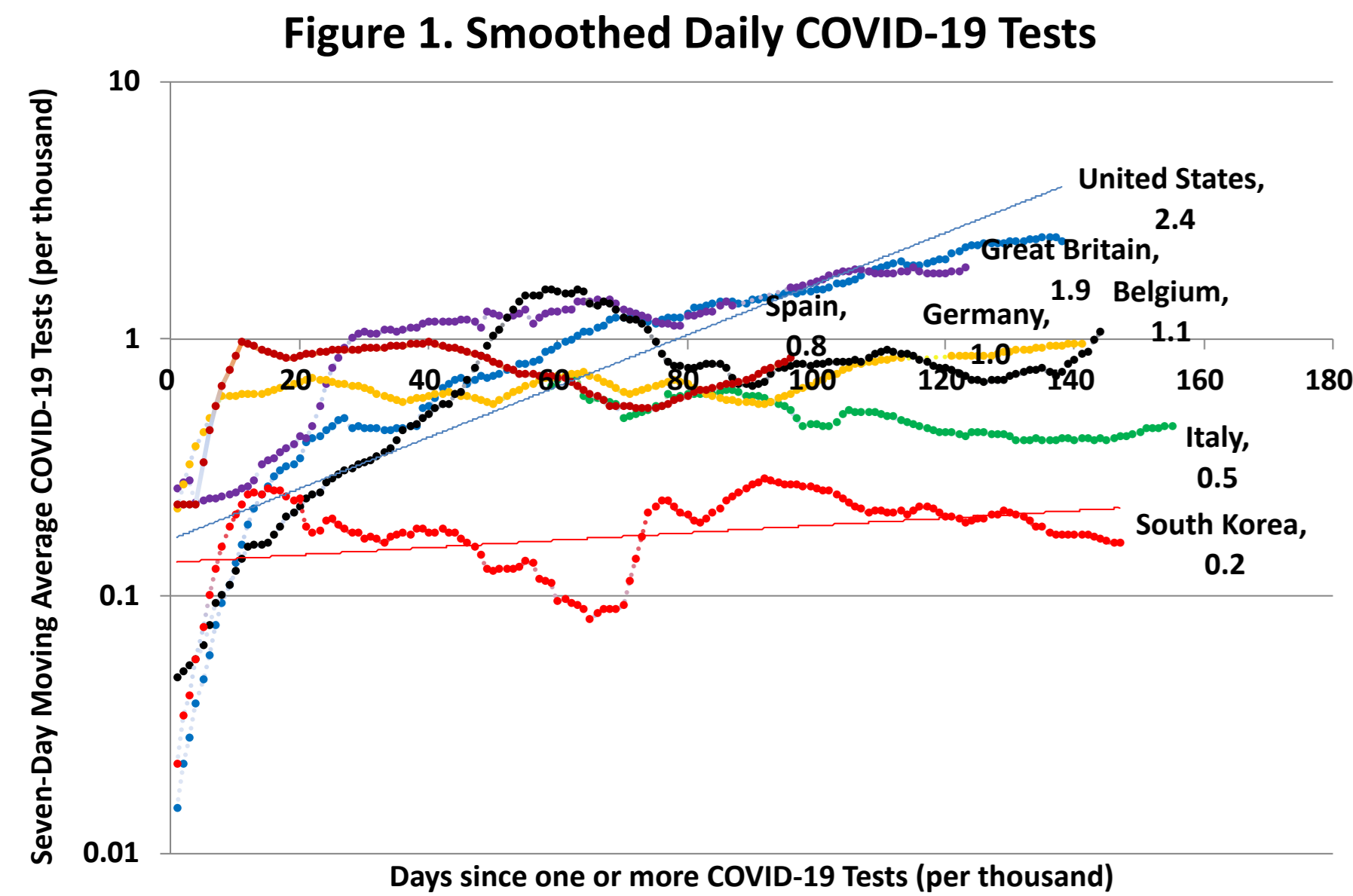
## Methods & Results

Seven-day moving averages were calculated from January 21 to July 31, 2020, daily per capita COVID-19 tests and coronavirus cases in seven countries: the United States, Italy, Spain, Germany, Great Britain, Belgium and South Korea.<sup>1</sup>

Daily COVID-19 test data yields seven-day moving average COVID-19 tests (per thousand) in Figure 1. COVID-19 testing in the United States trends upward with 2.4 tests per thousand daily on July 31, 2020, 12 times more than South Korea. In Figure 2, coronavirus cases in Europe and South Korea trend downward after peaking months earlier than the United States which averaged 200 cases per million on July 31, 2020, with no foreseeable plateau.

Combining tabular results, daily coronavirus tests per case in Figure 3 shows South Korea testing peaked at 685 tests per case in May, 30 times United States peak performance of 22 tests per case in June. One in 22 US tests (4.5%) positive compares with 0.15% (1/685) positivity in South Korea. Since < 10% COVID-19 tests were positive, the United States tested adequately. Positivity in European countries ranged from 0.5 to 1.0 cases per 100 tests or 0.5% to 1.0%.

Box-Jenkins time series models were fitted to smoothed tests per case for the United States. In Figure 4, graphical display of daily tests per case from mid-March to end-April shows a rise in actual values not a decline as predicted during the 14-day forecast period after the White House issued guidelines for re-opening.



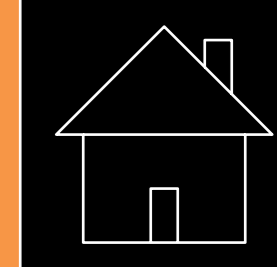
## Discussion

Ten or more COVID-19 tests were performed per coronavirus case to provide adequate testing in the United States. COVID-19 testing in Italy, Spain, Germany, Great Britain, Belgium and South Korea was more than adequate with hundreds of tests per case.<sup>2</sup>

when our poster was submitted, the United States totaled four million coronavirus cases, more than European countries and South Korea combined due to cultural and geopolitical differences. The US continues to be plagued by state-by-state disease outbreaks.<sup>3</sup>

## References

1. *Our World in Data, Coronavirus, COVID-19 Testing*  
<https://ourworldindata.org/coronavirus-testing>
2. At a March 30, 2020, WHO press briefing Dr. Michael Ryan suggested a positive rate < 10%, or even better < 3%, as a general benchmark of adequate testing.
3. *Johns Hopkins University, Daily State-by-State Testing Trends*  
<https://coronavirus.jhu.edu/testing/individual-states>



# Figures 1-4

